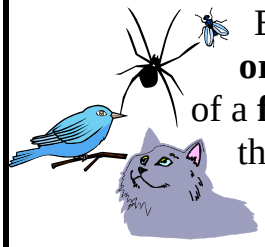
Student Fact Sheet D-2

Biological Magnification

Our Wonderful Planet

Animals are amazing! From killer whales in the ocean to tiny mites in the soil, our wonderful world is filled with many **diverse** or different types of animals. All animals – including human beings – need food to survive.

The Food Chain



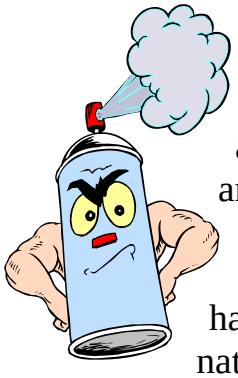
Every living thing or **organism** on this planet is part of a **food chain**. A food chain is the natural order of how plants and animals get food. For instance, in our garden, we might observe a fly caught in a spider's web. The spider will eat this fly and a bird might eat the spider. A cat might hunt and eat the bird. This is an example of a food chain. The natural order of how these organisms get food is from fly to spider to bird to cat.

Some food chains are simple and some are longer and more complicated. An important fact about food chains is that they are one way **toxins** or poisons can be spread from one living thing to another.

What is Biological Magnification?

Like a magnifying glass that makes things look bigger, **biological magnification** makes a toxin get bigger, or stronger as well. This happens when a toxin is **ingested** or eaten and moved up the food chain from one living thing to the next. As it moves up the food chain, the toxin gets magnified or more **concentrated**. This happens because when larger animals eat smaller animals or **prey**, they don't just eat one or two of these animals during their lifetime, sometimes they eat thousands or millions. Not only are these animals ingesting their prey, they're also ingesting all of their prey's toxins!

Pesticides



Let's look at **pesticides** for example. Pesticides are **toxic** or poisonous chemicals that are used to kill **pests**. A pest is an insect, animal or plant that is **out of place** or not where it belongs. While mice might have an important role to play in nature by spreading seeds and helping plants grow, they can spread dangerous diseases when they live out of place in our homes. Ever since the 1940's, pesticides have been widely used to kill pests. The suffix "**cide**" means "to kill". A **herbicide** kills weeds; a **rodenticide** kills rodents; a **fungicide** kills fungus and an **insecticide** kills insects.

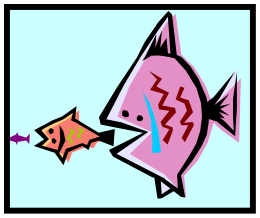
How harmful are pesticides?

Some pesticides like the chemical DDT – which began use in 1945 – create serious problems for the environment and our health. For over twenty-five years, DDT was sprayed on farm crops to kill damaging insects. It was also sprayed in homes and in airplane cabins to kill any mosquitoes that might have been inside carrying the malaria virus.

For many years, scientists thought DDT was safe to use. They later learned that this was not true. Although DDT was

effective in killing certain pests and slowing the spread of malaria, it was damaging to the environment and other living things.

DDT in Food Chain

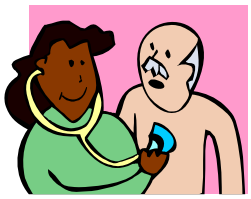


When DDT was sprayed on farm crops, some of it ended up in nearby streams, rivers and oceans. Tiny ocean organisms called plankton got **contaminated** or polluted with DDT. When shellfish ate the plankton, the shellfish became contaminated too. Bigger fish would eat the shellfish and seals would eat the bigger fish. These sea creatures also became contaminated. When a killer whale ate the seal, it too got poisoned. By the time the DDT had gotten into the killer whale however, it was millions of times stronger than when it first contaminated the plankton. This is because toxins like DDT can get stored and build up or **accumulate** in the fat or **fatty tissue** of animals. When animals eat other animals, they're also ingesting the toxins stored in their prey's fat. For example, if in one day a little fish eats 1,000 plankton and a whale eats 1,000 little fish, the whale is ingesting all the toxins that were in a million plankton!
(1,000 x 1,000 = 1,000,000)

Life at the Top of a Food Chain

In this example, plankton are at the bottom of a food chain. Shellfish eat the plankton, bigger fish eat the shellfish, seals eat the bigger fish and killer whales eat the seal. Since nothing eats the killer whale, it sits at the top of the food chain. That may sound like good news for the killer whale, but it isn't. Due to biological magnification and being at the top of the food chain, it suffers most from poisons. By the time the killer whale eats the contaminated seal, it's also eating the pesticides from thousands of contaminated fish, shellfish and plankton that were part of the seal's food chain. This is how biological magnification happens. The presence of toxins in fatty tissue increases or magnifies as it goes up the food chain. Sadly, when baby killer whales nurse from their mothers that are poisoned with chemicals, they can get very sick and die.

Our Health



Since human beings are also at the top of a food chain, we can be affected by biological magnification too. If we eat fish that come from contaminated waters, our bodies absorb the toxins. If too many toxins enter our bodies, it can lead to serious illnesses like cancer or birth defects.

Some of the worst chemicals like DDT have been **banned** or made illegal to use in the United States. Scientists and lawmakers realized that these chemicals are too toxic to the environment. DDT is one of the most famous toxic chemicals, but there are other pesticides and chemicals we don't know enough about that are still legal to use in the United States. Remember, just because something is legal to use doesn't mean it's safe to use.

The Good News!

We have the power to make choices that can help protect our health and the environment. Choose to use less-toxic materials whenever possible. Learn about eating organic foods and using less-toxic pest control, housecleaning products, body care products and other household items. Together, we can make a big difference!